

I.1 INTRODUCTION TO THE NWSRFS USER'S MANUAL

This manual describes the National Weather Service River Forecast System (NWSRFS) which is a comprehensive set of hydrologic techniques used by National Weather Service (NWS) River Forecast Centers (RFC's) to perform their forecast functions.

Development of the system began in 1971 and the initial version was documented in NOAA Technical Memorandum NWS HYDRO-14, National Weather Service River Forecast System River Forecast Procedures (Hydrologic Research Laboratory, 1972).

The NWSRFS User's Manual is available on the National Weather Service Office of Hydrologic Development Hydrology Laboratory Internet home page at the following Internet address:

<http://www.nws.noaa.gov/ohd/hrl>

NWSRFS includes techniques and programs for developing river forecasts from the initial processing of historical data to the preparation of forecasts. The programs are generalized for use on any river system.

The following is a brief description of each of the Parts.

Part I - General Information

This Part contains an introduction to the User's Manual, program execution information data, file creation information and other general information.

Part II - Models and Techniques

This Part contains the technical and scientific background of the system.

Individual chapters will be devoted to individual models or techniques.

Part III - User Information - Calibration Data Processing

This Part contains user information for historical data access programs and the calibration preprocessors.

Historical data for the entire US are available in for the following types of data:

- o hourly precipitation
- o daily climatological
- o synoptic meteorological
- o snow course

- o streamflow

Programs are available to inventory the data, store selected data in data files and read data from data files to compute mean areal precipitation, temperature and evaporation series which are then stored in data files.

Part IV - User Information - Calibration

This Part contains user information for calibration procedures.

Included in this Part is information related to conceptual models of snow, rainfall-runoff processes and streamflow routing. The following topics are included:

- o how to apply each model to a particular physical situation
- o how to use programs for estimating mean areal precipitation, temperature and evaporation
- o how to estimate parameters using manual and automatic estimation procedures

Part V - User Information - Operations

This Part contains user information for the Operations that are currently available for use within the various streamflow simulation programs (manual calibration, automatic optimization, forecasting and extended streamflow prediction). This Part also contains information about defining time series that are used by the Operations.

Part VI - User Information - Forecasting

This Part contains user information for forecast procedures.

The following topics are included:

- o how to apply the Operational Forecast System
- o how to use the programs to define the forecast network
- o how to enter data and produce a forecast
- o how to apply and use the Extended Streamflow Prediction System
- o how to use the Flash Flood Guidance System

Part VII - System Documentation - Calibration

This Part contains system documentation for the source code and data files used in the Calibration System.

Part VIII - System Documentation - Operations

This Part contains system documentation for the Operations that are currently available for use within the various streamflow simulation

programs.

This Part also describes how a user can add a new Operation to the forecast system. In addition, this Part describes the large internal arrays that are used to store information about the Operations and the time series data used by the Operations.

Part IX - System Documentation - Forecasting

This Part contains system documentation for source code and data files used in the Operational Forecast System, the Extended Streamflow Prediction System and the Flash Flood Guidance System.

Components of NWSRFS

NWSRFS includes the following:

- o hydrologic techniques and models
- o procedures for archiving, retrieving and processing the types of data needed to apply the system
- o methods for calibrating the various hydrologic techniques (for evaluating the parameters needed to apply a hydrologic or hydraulic model to a specific location)
- o programs for implementing the hydrologic techniques and support procedures described above in both the development and forecast systems

Techniques and Models

NWSRFS includes the following techniques and models:

- o techniques for estimating mean areal precipitation
- o techniques for estimating mean areal temperature
- o techniques for estimating mean areal evaporation
- o a mathematical model of the accumulation and ablation of snow
- o a soil moisture accounting model that accounts for flow through and above the soil mantle and for evaporation by converting moisture input to inflow to a channel system
- o channel routing models that account for movement of water in a channel system